THE GENERA OF SIMAROUBACEAE AND BURSERACEAE IN THE SOUTHEASTERN UNITED STATES [1]

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SIMAROUBACEAE A. P. de Candolle, Ann. Mus. Hist. Nat. Paris 17: 422. 1811, "Simarubeae."

(Quassia Family)

Trees and shrubs [rarely subshrubs], often with bitter bark. Leaves usually alternate, never glandular-punctate, pinnately compound or simple [rarely rudimentary], with predominantly entire margins, exstipulate [or stipulate]. Flowers usually small to minute, greenish or variously colored, hypogynous, regular, bisexual or unisexual by abortion, or both, with biseriate, [3]4–6[8]–, usually 5-merous perianth, in terminal and/or axillary many- or few-flowered cymose panicles or racemes, rarely solitary. Sepals distinct or united, imbricate or valvate. Petals distinct, imbricate or valvate, rarely wanting. Stamens distinct, as many or twice as many as the petals [rarely more numerous], usually inserted at base of an intrastaminal disc, rudimentary or wanting in ♀ flowers; filaments usually slender, sometimes appendaged at base on the ventral (adaxial) side; anthers usually versatile, 2- or rarely 4-locular at anthesis, introrse, longitudinally dehiscent. Intrastaminal nectariferous disc usually present, annular, cupular, cushion-like [to columnar], mostly lobed or crenate, rarely obscure or wanting. Gynoecium usually inserted on or encircled at base by the disc, sessile [or rarely raised on a gynophore], 2–6[8]-carpellate, apocarpous to syncarpous, rudimentary or wanting in ♂ flowers; stigmas distinct or united; styles basal, lateral or apical, distinct or partially to completely united; ovaries 1-carpellate and -locular (gynoecium apocarpous) or 2–3[4]-carpellate and -locular with axile placentae (gynoecium syncarpous); ovules anatropous or rarely orthotropous to campylotropous, usually epitropous, very rarely apotropous, 2- or rarely 1-integumented, with a thick nucellus, 1 or 2 (collateral or superposed) [very rarely more

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numerous] in a locule, pendulous from the top or ascendant from the base of the latter. Fruit apocarpous, of 2–6[8] one-carpellate and -locular drupes, [berries] or samaras, or a syncarpous, 2–3[4]-carpellate and -locular (occasionally 1-locular by abortion) berry, samaroid capsule [drupe or schizocarp] with 1-seeded locules. Seeds with membranaceous or leathery testa; endosperm scanty or wanting; embryo rather large, straight or rarely curved, with narrow, mostly fleshy, plano-convex or flat cotyledons and usually a very short radicle. (Including Surianaceae.) TYPE GENUS: *Simarouba* Aublet.

A pantropical family of about 30 genera and 200 species, at least two species in temperate eastern Asia. Four of twelve genera indigenous to the New World occur in subtropical Florida. One species of *Ailanthus* is also naturalized in our area.

The rather heterogeneous family includes six sharply delimited subfamilies. Evidence from wood anatomy supports the segregation of at least some as distinct families, but, since data from gross morphology appear to be inconclusive and those from floral anatomy, embryology, and cytogenetics of the family are fragmentary, it seems preferable to retain the family in the larger sense.

Simaroubaceae are closely related to Rutaceae and Burseraceae, differing from the former mainly in the absence of multicellular glands (secretory cavities) with aromatic oils in leaves, axes, and floral parts, and from the latter in the absence of schizogenous resin ducts in the bark.

Wood and/or bark of some species (e.g., *Picrasma excelsa* (Sw.) Planch., "Jamaica Quassia"; *Quassia amara* L., "Surinam Quassia") yield a bitter principle employed as tonics and vermifuges, as an insecticide, and sometimes as a substitute for hops in brewing. Some genera produce timber of local importance; a few species are ornamentals.

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Key to the Genera of Simaroubaceae

General characters: *trees or shrubs with alternate, predominantly pinnate leaves; flowers small, uni- or bisexual, or both; perianth double, usually 5-merous; stamens 5 or 10, distinct; intrastaminal disc usually present; gynoecium apo- or syncarpous, 2–5-carpellate; ovules 1 or 2 in each locule.*

A. Leaves simple, small (not over 5 cm. long) and narrow; flowers bisexual, in short, terminal, few-flowered, corymb-like panicles, rarely solitary; stamens 10, the 5 antipetalous usually staminodial or rudimentary; intrastaminal disc wanting; carpels distinct; fruit of 5 or fewer achene-like drupelets; strand plant of subtropical Florida. . . . . 1. *Suriana*.

A. Leaves pinnately compound; flowers usually unisexual (occasionally also bisexual) in large, many-flowered, complex terminal panicles or racemes; intrastaminal disc distinct; carpels connate, sometimes only by the styles, rudimentary or wanting in ♂ flowers; fruits various, never achene-like drupelets.

B. Stamens 10 in ♂ flowers, much reduced or wanting in ♀ flowers; carpels 4–6, usually 5; styles lateral, connate; ovaries distinct, connivent; fruits aggregate.

C. Leaves usually even-pinnate, persistent; leaflets alternate, ± leathery, entire; staminal filaments appendaged at base; fruit of 5 or fewer olive-shaped drupes about 2 cm. long; hammocks of subtropical Florida. . . . . 2. *Simarouba*.

C. Leaves odd-pinnate, deciduous; leaflets usually opposite, thin, with a few glanduliferous teeth or lobules near the base; staminal filaments without appendages; fruit of 5 or fewer oblong samaras 3–5 cm. long, each with a flattened seed at the middle of the membranaceous wing; northern Florida and northward. .... 3. *Ailanthus*.

B. Stamens 5 and alternate with the sepals in ♂ flowers, reduced or wanting in ♀ flowers; carpels 2 or 3; styles terminal, connate or distinct; ovary compound; leaves odd-pinnate; hammocks of subtropical Florida.

D. Leaflets 5–9, 5–12 cm. long; ♂ and ♀ flowers with linear-lanceolate petals, in terminal panicles with slender racemose or spikelike branches; stigma 2-lobed; style one, very short and stout; fruit a 1- or 2-seeded berry. .... 4. *Picramnia*.

D. Leaflets 19–51, 1–3 cm. long; ♂ flowers with linear-filamentous petals, the ♀ flowers without petals, in terminal and axillary racemes; stigmas 3; styles 3, distinct, subulate, short; fruit a flat, papery, 1-seeded samaroid capsule. .... 5. *Alvaradoa*.

Subfam. SURIANOIDEAE Engler

1. **Suriana** Linnaeus, Sp. Pl. 1: 284. 1753; Gen. Pl. ed. 5. 137. 1754.

Shrubs or small trees 1–8 m. high with most parts more or less densely pubescent with simple and glandular hairs. Leaves sessile, simple, entire, narrow (seldom over 4 cm. long), thickish, with indistinct lateral veins and centric mesophyll. Flowers relatively small, bisexual, obdiplostemonous, with 2-bracteolate pedicels, in terminal, few-flowered, corymb-like cymose panicles (sometimes reduced to a solitary flower). Sepals 5, narrow (about 6–10 mm. long), connate at base, imbricate, persistent. Petals 5, yellow, broad, clawed, about as long as the sepals, imbricate. Stamens 10, distinct, the antipetalous usually antherless or rudimentary; filaments subulate, hairy below; anthers subcircular in outline, emarginate at both ends, introrse, 2-locular at anthesis; pollen grains medium sized, suboblate, 3-colpate, finely striate. Intrastaminal disc apparently wanting. Gynoecium apocarpous, 5-carpellate; stigmas distinct, capitellate; styles distinct, filiform, nearly basal; ovaries 1-locular, sessile; ovules 2 (collateral), ascending from the base of the ovary locule, 1-integumented, orthotropous, becoming campylotropous after fertilization. Fruits 1-seeded achene-like drupelets (not over 5 mm. long) with thin flesh and crustaceous endocarp (stone), obovoid-subspherical, pubescent. Seeds broadly obovoid, slightly flattened laterally, endospermless, with a thin membranaceous testa; embryo horseshoe shaped, with flat, oblong cotyledons and an elongate radicle descendent toward the micropyle which is side by side and in contact with the hilum. TYPE SPECIES: *S. maritima* L. (Named in honor of Joseph Donat Surian, a French physician and botanist, "Dioscorides Americanus futurus" [Plumier, Nov. Pl. Am. Gen. 37. 1703], companion and collaborator of Plumier.) — BAY CEDAR.

A monotypic genus represented by *Suriana maritima*, widely but sporadically distributed on the seashores of the New and Old World tropics, but apparently absent from the Pacific coasts of the Americas, the islands of the Central Pacific, and the Atlantic coast of Africa. It occurs in the coastal sand dunes and hammocks of the Florida Keys and of peninsular Florida northward to Brevard and Pinellas counties, and beyond our area in Bermuda, the West Indies, and from Yucatán south to Brazil. Millspaugh (Publ. Field Mus. Bot. 2: 241. 1907) believed the fruits (stones) to be carried on the feet of sea birds, but according to Guppy they "could readily be carried in the crevices of floating logs, or in the cavities of floating pumice, such as is stranded on the beaches of tropical regions all over the world. But it is on their great floating powers, which fit them for dispersal by currents, that we must mainly rely." Buoyancy of the stones is produced by the unfilled space in the fruit locule (Guppy, Schimper).

Record & Hess (1943, p. 521), Small (Man. 761. 1933), Wilson (1911), and a few others thought the genus to represent a distinct, monotypic family Surianaceae; but, if a separate family is recognized, it should also include the closely related genera *Cadellia* F. Muell., *Guilfoylia* F. Muell., and perhaps also *Recchia* Sessé & Moc. ex DC. (*Rigiostachys* Planch.).

The branches exude some kind of "manna."

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Subfam. SIMAROUBOIDEAE

Tribe SIMAROUBEAE

2. **Simarouba** Aublet, Hist. Pl. Guiane Fr. 2: 859. 1775.[2]

Trees or large shrubs with bitter bark and wood. Leaves even-pinnate [or odd-pinnate], persistent; leaflets 3–21, mostly 8–16, alternate, rarely opposite, entire, ± coriaceous, shortly petiolulate. Plants polygamo-dioecious or dioecious. Flowers small, unisexual or uni- and bisexual, obdiplo-

[2] Aublet's generic name should be conserved against its earlier homonym, *Simaruba* Boehmer, 1760 [nom. rejic. vs. *Bursera* Jacquin ex Linnaeus, 1762, nom. cons.]. See A. A. Bullock, Taxon **8**: 199. 1959.

stemonous, in large terminal and axillary complex panicles. Sepals 4–6, usually 5, rather small, connate at least at base, imbricate. Petals 4–6, usually 5, yellowish to yellow [or whitish], much longer than the sepals, imbricate. Stamens 8–12, usually 10, as long as the petals, reduced, rudimentary or absent in ♀ flowers; filaments subulate, broadened toward base, with an adaxial, liguliform, pubescent appendage at base; anthers oblong in outline, slightly emarginate, versatile, 2-locular at anthesis; pollen grains small, subprolate, 3-colpate. Intrastaminal disc ± cushion-like, depressed in ♂ flowers. Gynoecium (4)5(6)-carpellate, sessile on the disc, partially syncarpous, rudimentary or wanting in ♂ flowers; stigmas 4–6, usually 5, long, slender, and divergent in ♀ flowers, short, lobe-like in bisexual flowers; styles connate into a short column; ovaries distinct, 1-locular, cohering [or perhaps sometimes weakly connate] by their ventral sutures and thus resembling a compound deeply lobed ovary; ovules solitary in each carpel, pendulous from near the top of the inner angle of the locule, anatropous and epitropous, 2-integumented. Drupes 5 or fewer from each flower, ellipsoid to obovoid, slightly laterally compressed, usually 2-ridged, with thin flesh and a crustaceous stone. Seeds endospermless; testa thin, membranaceous; embryo straight, with fleshy, plano-convex cotyledons and a very short, superior radicle partly included between the cotyledons (retracted). TYPE SPECIES: *S. amara* Aublet. (Name derived from the Carib Indian name of the type species in French Guiana.)

A tropical American genus of about six species. *Simarouba glauca* DC., paradise tree, occurs in coastal hammocks on the Florida Keys and in southern peninsular Florida (Dade, Broward, and Palm Beach counties). It is widely distributed in the West Indies and in Central America from Costa Rica to southern Mexico. The ellipsoidal fruits, about 2 cm. long, are scarlet, changing to dark purple or black when ripe. A white-fruited form has been reported from El Salvador.

The timber of some species, especially the South American *Simarouba amara*, is of commercial importance. The bitter bark of roots of *S. amara* and *S. glauca* is said to be efficient against diarrhea and post-dysenteric disorders. Seeds of *S. glauca* yield about 60 per cent of edible oil and a crystalline glycoside, glaucorubin, which reportedly has amoebicidal properties and is now being introduced in most of the major tropical areas under the trade name of "Glaumeba."

The genus is a representative of a very natural group, Simarouboideae–Simaroubeae, and is closely related to the tropical South American *Simaba* Aubl. and *Quassia* L. (monotypic, according to Cronquist), as well as to the tropical African *Odyendea* (Pierre) Engl.

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Tribe PICRASMEAE Engler

3. **Ailanthus** Desfontaines, Mém. Acad. Sci. Paris **1786:** 265. 1788, nom. cons.

Trees, sometimes strong smelling. Leaves odd-pinnate, large, deciduous; leaflets opposite or alternate, thin, with a few glanduliferous, blunt teeth or lobules near base [or entire or rarely coarsely toothed to lobed throughout], petiolulate. Plants polygamo-dioecious. Flowers small, uni- and bisexual, obdiplostemonous, of unpleasant odor, pediceled, in large, terminal panicles. Sepals 5 (6), connate in the lower third or higher, imbricate. Petals 5 (6), longer than the sepals, greenish or yellowish, induplicate-valvate in aestivation. Stamens inserted at base of an intrastaminal disc, 10 (12) in ♂ flowers, sometimes fewer in bisexual, much reduced and sterile or absent in ♀ flowers; filaments subulate, without appendages; anthers oblong or oblong-ovate in outline, versatile, 2-locular at anthesis, subintrorsely dehiscent; pollen grains small to medium sized, subspheroidal, 3-colpate, reticulate. Intrastaminal disc annular, thick, usually deeply 5(6)- or 10(12)-lobed, or crenate, of receptacular origin. Gynoecium 5(6)-carpellate [rarely 3-carpellate], partially syncarpous [or apocarpous], sessile within the disc, rudimentary or absent in ♂ flowers; stigmas distinct, tongue-shaped and divergent or ± capitellate; styles lateral, filiform, usually connate [or distinct]; ovaries 1-carpellate and -locular, much compressed laterally, distinct but ± cohering by their sutures and resembling a compound, deeply lobed ovary; ovules anatropous, 2-integumented, solitary in each carpel, hanging from below the insertion point of the style. Fruit of (1)2–5(6) distinct, oblong to oblong-elliptic samaras, each with a flattened seed at the middle of the thin, veiny, adaxially emarginate wing. Seeds lenticular, with thin, membranaceous testa and sparse, fleshy endosperm; embryo with flat, obovate to orbicular cotyledons and a short, superior radicle. TYPE SPECIES: *A. glandulosa* Desf. (= *A. altissima* (Mill.) Swingle). (Name derived from the Moluccan name for *A. integrifolia* Lam., *ailanto*, tree-of-heaven, in allusion to the height of the trees.) — TREE-OF-HEAVEN.

A primarily tropical genus of about 15 species, distributed in eastern and southern Asia, the Philippines, Malaysia, Melanesia (east to the Solomon Islands), and northeastern Australia, extending into the Temperate Zone to northeastern China and Korea (to about 40° N. Lat.). The northernmost species, *Ailanthus altissima* (Mill.) Swingle, Chinese tree-of-heaven, stinkweed, $2n = 80$, introduced into North America in 1784 as an ornamental tree, has become naturalized in native woodlands of the southeastern United States as far south as northern Florida. Northward and westward beyond our area it seems to be primarily a "weed" tree of cities, but the exact extent of naturalization needs to be more carefully recorded. An irregularly branched, rapidly growing tree which reproduces by seeds, stump sprouts, and root suckers, it becomes a weed difficult to eradicate. However, it has sometimes been used for fastening sterile, sliding declivities and for aforestation of bare hill and mountain slopes (Alps, Caucasus) and of grasslands (Asia Minor). The leaves contain a substance toxic to seedlings of many species of gymnosperms and angiosperms. "It is possible that the toxic substance is washed from the [fallen] leaves by the rain and influences the composition of plant communities" (Mergen).

Small flies and beetles have been recorded as pollinators in *Ailanthus altissima*, but bees must participate since it is regarded as an undesirable honey plant. Wind pollination is also possible (cf. Wodehouse). Floral anatomy has been studied in this and a few other species, embryology only in the Indian *A. excelsa* Roxb., $2n = 62$. Apparently only two chromosome counts have been recorded.

Wood of *Ailanthus altissima* and the other species appears to be of relatively little value, being used mostly for fuel, occasionally for cabinet work, musical instruments, etc. It also seems to be fit for paper pulp. Leaves and bark of *A. altissima*, and bark of a few other species are used locally in Asia as anthelmintics or antidysenterics.

The genus occupies a somewhat isolated position in the tribe Picrasmeae of Simarouboideae, representing a subtribe of its own.

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Subfam. PICRAMNIOIDEAE Engler

4. **Picramnia** Swartz, Prodr. Veg. Ind. Occ. 2, 27. 1788, nom. cons.

Trees or shrubs, usually with slender, curving branches, the bark and wood often very bitter. Leaves odd-pinnate, persistent; leaflets [3]5–9[21], opposite or alternate, entire, chartaceous to ± coriaceous, petioluled. Plants dioecious [or occasionally polygamous]. Flowers minute, unisexual [occasionally also bisexual]. Inflorescences paniculate, terminal [sometimes opposite the leaves], with slender, raceme- or spikelike branches. Sepals 5 [3 or 4], connate from ¼ to ½ of their length, imbricate. Petals 5 [3 or 4, or wanting], narrowly linear-lanceolate [or lanceolate], as long [or twice as long] as the sepals, imbricate. Stamens as many as and opposite the petals, inserted below and between the lobes of a low intrastaminal disc, reduced to staminodia in ♀ flowers; filaments subulate; anthers basifixed, almost globular, with thick connective, introrse, 4-locular at anthesis. Gynoecium 2(3)-carpellate, syncarpous, rudimentary in ♂ flowers; stigma deeply 2-lobed, the lobes thick, divergent; style very short and stout, usually inconspicuous; ovary sessile, 2(3)-locular; ovules anatropous, epitropous, 2-integumented, pendulous from near the top of the carpels, 2 in each locule. Fruit a rather juicy, subglobular, ellipsoidal or obovoid berry, (3)2- or (by abortion) 1-locular, with 1-seeded locules. Seed ovoid, often plano-convex, filling the cavity of the locule, the testa membranaceous, adnate to the undifferentiated embryo; endosperm wanting. (*Pseudobrasilium* Adans., 1763; *Tariri* Aubl., 1775; nom. rejic.) TYPE SPECIES: *P. antidesma* Swartz. (Name derived from Greek, *pikros*, bitter, and *thamnos*, shrub, in allusion to the bitterness of the vegetative parts.) — BITTERBUSH.

A genus of about 40 species of tropical American distribution. *Picramnia pentandra* Sw., a shrub or small, slender tree, of the West Indies, Colombia, and Venezuela, occurs in our area in the coastal hammocks of southeastern peninsular Florida (Dade County) and on the Florida Keys. Berries of this species are olive-shaped, 9–15 mm. long, red, turning black when fully ripe; the seeds are light brown and lustrous. Leaves, bark, and roots of this and other species have been used locally in the tropics as febrifuges.

The genus, which represents a subfamily of its own, is in need of a revision.

REFERENCES:

Under the family references see ENGLER (1931, pp. 402, 403), RECORD & HESS, SARGENT, SMALL, and WEST & ARNOLD (p. 101).

RADLKOFER, L. Ueber die Gliederung der Familie der Sapindaceen. Sitz-ber. Akad. Wiss. München II. **20:** 105–370. 1890. [*Picramnia*, relationship with *Alvaradoa*, 139–143.]

Subfam. ALVARADOIDEAE Engler

5. **Alvaradoa** Liebmann, Vid. Medd. Nat. For. Kjøbenh. **1853:** 100. 1854.

Shrubs or trees up to 15 m. high, with slender, terete, pubescent [or glabrous] branchlets and bitter bark. Leaves odd-pinnate, many-foliolate, crowded at the end of branches, apparently persistent; leaflets alternate, small (not over 5 cm. long), thin and firm [or leathery], entire, petiolulate. Plants dioecious. Flowers minute, unisexual, in slender, many-flowered, axillary or terminal racemes. Sepals 5, usually distinct in ♀ flowers and variously connate from near the base to the half of their length in ♂ flowers, valvate. Petals 5, linear-filamentous, present [or absent] in ♂ flowers, wanting in ♀ flowers. Stamens 5, alternate with the sepals, inserted below and between the lobes of the disc, wanting in ♀ flowers; filaments filiform, hairy in the lower part; anthers basifixed, oblong in outline, with a conspicuous, almost orbicular, swollen connective and introrse anther-halves, 4-locular at anthesis; pollen grains small, prolate-subspherical, 3-colpate. Intrastaminal disc thickish, deeply 5-lobed in ♂ flowers, thin and scarcely lobed in ♀ flowers. Gynoecium 3-carpellate (but only 1 carpel fertile), syncarpous, sessile on the disc, wanting in ♂ flowers; stigmas small, simple; styles 3, distinct, subulate, short, recurved; ovary densely villous, flattened, obtusely triangular in cross section, imperfectly 2- or 3-locular on account of 2 incomplete partitions (apparently deeply intruded parietal placentae) demarcating a sole fertile locule in the obtuse angle of the ovary; ovules 2 in the fertile locule, basal, ascendent, anatropous, apotropous, 2-integumented. Fruit a compressed, 2[3]-winged, ± papery samaroid capsule [or leathery samara], crowned by remnants of the styles, appearing 3- or 1-locular, with 1 seed in the lower half. Seeds ± terete, narrowly ellipsoidal (the shape of rice grains) [or rather compressed and broadly elliptical in outline]; testa membranaceous; endosperm wanting; embryo straight, with plano-convex [or flat], fleshy cotyledons and a short, inferior radicle. TYPE SPECIES: *A. amorphoides* Liebm. (Named in commemoration of Pedro de Alvarado, one of the chief aides of Hernando Cortez in the conquest of Mexico.)

A genus of about five species, the range disjunct, including southern Florida, the West Indies, Mexico, and Central America, Bolivia, and Argentina. *Alvaradoa amorphoides* occurs in a few hammocks in southern peninsular Florida (Dade County) and the Florida Keys and in the West Indies, Mexico, and Central America.

Although the genus was originally placed with the Sapindaceae, Radlkofer showed *Alvaradoa* to be simaroubaceous with the closest relationship to *Picramnia*. Engler, however, placed the two in separate unigeneric subfamilies.

REFERENCES:

See also under family references, CRONQUIST (pp. 132–137), ENGLER (1931, p. 404), RECORD & HESS (p. 510), SARGENT (pp. 644, 645), SMALL, and WEST & ARNOLD (p. 104).

RADLKOFER, L. Ueber die Gliederung der Familie der Sapindaceen. Sitz-ber. Akad. Wiss. München II. **20**: 105–370. 1890. [*Alvaradoa*, morphology of the flowers and fruits, relationship with *Picramnia*, 139–143.]

BURSERACEAE Kunth, Ann. Sci. Nat. 2: 346. 1824.

(TORCHWOOD FAMILY)

Trees or shrubs, the inner bark with resin ducts. Leaves alternate, usually once pinnate, deciduous [or persistent], usually exstipulate. Flowers small, hypogynous, regular, apopetalous, usually unisexual by abortion, 3–5-merous, in axillary [or terminal] cymose panicles. Plants mostly dioecious. Stamens 6–10, usually distinct, inserted below an intrastaminal [rarely extrastaminal] nectariferous disc; anthers versatile, introrse, longitudinally dehiscent, sterile in ♀ flowers. Gynoecium 3[2–5]-carpellate, syncarpous, rudimentary or wanting in ♂ flowers; ovary 3[2–5]-locular, with axile placentae; ovules anatropous, epitropous, 2 in each locule. Fruit usually drupaceous, with ± dry [or fleshy] exo- and mesocarp, dehiscent by valves [or indehiscent]; stones solitary [or 2–5], 3[–5]-, usually 1-locular by reduction or abortion of 2 locules. Seeds without endosperm, solitary in each locule; embryo straight [or curved], cotyledons contortuplicate [or flat], usually ± deeply lobed, radicle superior. TYPE GENUS: *Bursera* Jacq. ex L.

A pantropical family of 15 or 16 genera and about 600 species. Six genera (including *Bursera* and *Protium*) with about 200 species occur in the New World. The family is subdivided into the tribes Protieae Engl., Bursereae [H. J. Lam] (Boswellieae Engl.), and Canarieae Engl. The subdivisions, although based exclusively upon the structure of the fruits, seem to be rather natural ones.

Burseraceae are closely allied with Rutaceae, Simaroubaceae, and Meliaceae. A close relationship to Anacardiaceae, proposed by some taxonomists (e.g., Radlkofer), is supported by evidence from anatomy and palynology.

Resinous substances obtained from some species are of economic significance. The most important of these are myrrh, from *Commiphora molmol* Engl. and *C. abyssinica* (Berg) Engl., and olibanum or frankincense, from species of *Boswellia*, especially *B. Carteri* Birdw. Myrrh is used in perfumery, and both are used in medicine and as incense.

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1. **Bursera** Jacquin ex Linnaeus, Sp. Pl. ed. 2. **1**: 471. 1762; Gen. Pl. ed. 6. 440. 1764, nom. cons.

Trees [or shrubs]. Leaves odd-pinnate [sometimes bipinnate], 3–9[–many]-foliolate [rarely 1-foliolate], usually crowded at the end of branchlets, deciduous; leaflets opposite, chartaceous to subcoriaceous [or coriaceous], entire [or toothed], manifestly petiolulate [to sessile]. Flowers very small, unisexual [and/or bisexual], in axillary, raceme-like panicles, appearing prior to or with [or after] the leaves. Plants dioecious [or polygamous?]. Sepals 3–5, minute, connate at least at base, imbricate in bud. Petals 3–5, whitish to creamy, much longer than the sepals, spreading and recurved, induplicate-valvate in bud. Stamens 6–10, nonfunctional in ♀ flowers; filaments subulate; anthers oblong in outline, dorsifixed near the base, shorter and without pollen in ♀ flowers; pollen grains medium-sized, 3-colpate, reticulate-striate. Intrastaminal disc annular, 6–10-lobed, orange or red. Stigma capitate, 3-lobed; style short, ovary sessile, ovoid, 3-carpellate and -locular, with 2 collateral, pendulous ovules in each locule, rudimentary in ♂ flowers. Drupes subglobular or obliquely ellipsoid, indistinctly triangular, with resinous, fleshy, leathery exo- and mesocarp detaching in 3 [or 2] valves when the fruit matures; stones (bony endocarp) covered with a thin, membranaceous, light-pink coat (probably the innermost layer of mesocarp remaining attached to the endocarp), usually solitary, attached to the persistent axis of the ovary, ovoid-trihedral, essentially 1-locular, but bearing 2 minute, sterile locules or rudimentary stones in the upper half on the adaxial (ventral) side, usually 1-seeded. Seeds without endosperm; testa membranaceous; embryo straight [or curved] with foliaceous, contortuplicate cotyledons and a short superior radicle. Germination epigeous, cotyledons 3-fid, the first leaf 3-foliolate. (*Elaphrium* Jacq., 1760; *Simaruba* Boehmer, 1760; nom. rejic.) TYPE SPECIES: *B. gummifera* L. (= *B. Simaruba* (L.) Sarg.). (Named in honor of Joachim Burser, 1583–1639, a German physician and botanist.)

A genus of about 100 species of tropical America. *Bursera Simaruba* (*Elaphrium Simaruba* (L.) Rose), gumbo-limbo or West Indian birch, of the West Indies, Mexico, Central America, and northern South America, occurs in coastal hammocks on the Florida Keys and in peninsular Florida about as far north as Brevard and Pinellas counties. Easily recognizable by its lustrous, smooth, copper-colored bark which exfoliates in thin, papery layers as in some species of *Betula*, in winter the tree (to 20 m.) is conspicuously leafless, in contrast with its evergreen associates. The species is a common "fence-post" tree in tropical America, for pieces of the trunk or branches set in the ground quickly develop roots and grow into trees. The Mexican *B. fagaroides* (HBK.) Engl. and *B. microphylla* Gray occur in southern Arizona, the latter in southeastern California as well.

Insect pollination has been presumed for the genus, but no data are available. *Bursera Simaruba* apparently is dioecious; records of polygamy are in need of verification. Staminate flowers in this species are 5-merous (or more rarely 4-merous), while the carpellate appear to be almost invariably 3-merous and only very rarely 4-merous.

The species of *Bursera* yield a fragrant glutinous resin which is locally applied in domestic medicine. The resin of *B. Simaruba* is also used as a substitute for glue and as cement for mending broken china and glass.

The genus seems to be most closely related to the paleotropic *Boswellia* Roxb. ex Colebr.

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